

# KEUFFEL & ESSER CO.

## DRAWING MATERIALS AND SURVEYING INSTRUMENTS.

CHICAGO. SAN FRANCISCO. ST. LOUIS.

### TABLES FOR EXCAVATIONS AND EMBANKMENTS.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.  
ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.  
FOR SINGLE TRACK EXCAVATION

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	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	0
1	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	1
2	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	2
3	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	3
4	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	4
5	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	5
6	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	6
7	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	7
8	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	8
9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	9
10	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	10
11	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	11
12	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	12
13	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	13
14	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	14
15	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	15
16	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	16
17	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	17
18	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	18
19	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	19
20	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	20
21	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	21
22	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	22
23	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	23
24	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	24
25	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	25
26	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	26
27	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	27
28	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	28
29	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	29
30	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	30
31	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	31
32	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	32
33	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	33
34	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	34
35	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	35
36	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	36



Jan. 18, 1914

Elevations of New Center line plugs

+5 Sta	+5 Rod	H.T.	-5 Sta.	-5 Rod	-5 E.L.
5503	12201	-190	120.11	6297	-395
					12406

6293	-341	123.52
------	------	--------

6448	-423	124.34
------	------	--------

6549	-321	123.32
------	------	--------

6607	-370	123.81
------	------	--------

Bread 6697 ft. 0 - Ditch at 6614.

Sucker pipe 6442

4" line to end of Ditch.

Permanent track laid to 6552

Tunnel width 11.015 at 8 AM Jan 19/1914 same.

Completion of Williams contract.

Bread left at 6697 Total Advance 975 ft.

Ditch " " 6614 (83 ft from B)

Permites " " 6552 (145 ft from B)

Sucker pipe " " 6442 (255 ft from B)

4" Air line " " 6617 (80 ft from B)

Last 5 ft of Bottom 6" high.

Feb 4, 1914

Tunnel wair h = 1.19 3 PM

Feb 5 1914 noon

h = 1.26

Measured by Friendly

Elevations

Traffic E.L.

Discharge

Old line plug

11573

779

11612

8.22 Tie 8.50

11637

6.95 Tie 7.00

11652

7.29 Temp rail 7.00

Beginning of New West Tunnel Co. contract

Bread at 6697

Ditch at 6614

Sucker pipe at 6602

Permites at 6607



Elevations		Feb. 11, 1914		The Elev.		Dist. above Sta.		
+ S Sta 123.52 6295	+ S Rod HI -2.30	121.22	6549	-5.84	-2.13	123.35	116.37	7.31
			6607	-2.61	123.83	116.52	7.76	
			6682	-3.24	124.46	116.90	8.26	
			6761	-3.94	125.16			
	Bench at 6790							
	Ditch at 6687							
	Ties at 6660							
	Tunnel wall h = 1.27 at 1 Rd (sum)							
Elevations Feb. 14, 1914								
123.52 6295	-2.14	121.38	6549	-1.97	123.35	116.37	6.98	
			6607	-2.46	123.84	116.52	7.32	
			6682	-3.08	124.46	116.90	7.76	
			6761	-3.83	125.21		8.31	
	Bench at 6815							
	Ditch 6707							
	Ties 6680							
Elevations Feb. 21, 1914								
123.35 6549	-2.22	121.13	6682	-3.34	124.47	116.70	7.77	
			6761	-4.07	125.20	116.90	8.30	
	Tie Highest point	6791	(1" higher than rail under plug 6761)					
	Bench 6874							
	Ditch 6785							
	Ties 6695							
	Summit 6690							

Elevations

# Tunnel Weir

Weir torn out by H.L. Storer on Feb 20 1914 and one side removed, giving end contraction on one side only.

Gauge on Feb 21 at 1 P.M. -  $h = 11.6$  corrected  $h = 11.7$

Measurement on Feb 27 at 9 A.M. by O.H. Friendly.  $Q = 12005$

$h$  (corrected) = 11.6 -  $Q = 11.85$  sec. ft.

$Q$  taken from Rating Curve drawn by H.L. Storer of U.S.G.C.

March 2, 1914 - Monthly estimate for Feb.

Breast at 6741. Advance  $\approx 74$  ft.

Ditch between 6830. Advance  $\approx 16$  ft.

Reinment track - 6790. " 183 ft.

Sucker pipe at 6760. " 158 ft.

## Geology -

At 6719 Granite appears with an normal dip of  $\pm 25^\circ$  to the NW. and continues for 75 ft. corresponding to a bed approximately 30 ft. thick. Narrow beds of lime appear in the granite. From 6795 to Breast formation is similar to that exposed there by Williams & containing ls. - hard lime of good breaking quality. Stones well and requires no timber.

Numerous fissures and open water courses strike across the Tunnel and dip  $70^\circ$  S.E. These fissures carried water under heavy pressure when first struck but during the month they have dried up above the ditch level. They are still producing water from below. The breast is dry.

Tunnel No. 1 - 3/2/14 - 4:30 P.M.  $h = 11.2$   $Q = 11156$  sec. ft.

--- 253 ---

End contraction on 1 side only - incomplete length of Weir crest = 253 ft. To measure  $h$ , take gauge readings by distance between brass points and subtract 0.2' for free board.

Distance from Breast 141 ft.

" " 18 ft. The under 6761 = 780 out

" "  $\approx 11$  ft.





March 26 1914  
- Elevations -

+S Sta	+S Rod	H.I.	-S Sta	-S Rod	-S Elev.	True Tie El
124.85 6954	-1.69	123.16	7077	-2.25	125.41	117.69
			7164	-2.36	125.52	117.91
			7157	-1.84	125.00	117.89

Breast at 7183 at 11 AM.

Ditch at 7087

Ties at 7000

Sucker pipe at 6982

Tunnel weir at 1:30 PM. (snowing)

$$h = 1.09 \quad Q = 10.72 \text{ sec. ft.}$$

April 2, 1914

Breast at 7269 at 4 PM. Advance 298 ft.

Ditch broken to 7155 - mucked to 7100 - 114 ft from Br.

Ties to 7092 - 127 ft from Br.

Sucker Pipe at 7087 - 122 ft from Br.

Tunnel weir at 5 PM.

$$h = 1.04$$

$$Q = 9.94$$

Elevations Water  
Creek  
Ditches

Dist. above tie.

$$7.72 \text{ rail} = 7.20$$

$$7.61 \text{ turnsheet} = 7.14$$

7.11 screw eye in cap - not to be used unless plug 7164 is knocked out.

$$\text{Grade light under } 7164 = 2.61 - 41 = 2.20$$

$$\text{Grade light under } 7157 = 2.11 - 41 = 1.70$$

Breast is in fine grained limestone similar to that cut last month.

Breast is dripping water but there are no heavy flows. At a point 100 ft from Breast a 2" pipe could carry off the water.

At a 7150 large fault fissure strikes N50 E dip 65° S.

Breccia soft lime and requires timbering for 12 ft. It is dry and will not cause trouble.

At a 7065 open water course strikes N30 E Vertical. is now dry above ditch level.

Similar one at 7080, somewhat smaller, making an S curve water from SW side. Dry above track level.

At a 7100 water course (dry) strikes N70 E Dip 65° N.

April 3<sup>rd</sup> 1914.

Elevations.

+S Sta	+S Rod	H.I.	-S Sta.	-S Rod	-S Elev	True Tie E.I.	Pist. above Tie	Remarks
125.41 7077	-2.13	123.28	7164	-2.28	125.56	117.91	7.65	Temporary rail 7.14
			7255	-1.82	125.10	118.14	6.96	Temporary rail 6.70
Breast at 7275.5								

Grade lights under 7164 2.32  
under 7255 1.66

April 16, 1914

Elevations

125.56 7164	-2.35	123.21	7255	-1.88	125.09	118.14	6.95	Permanent tie <del>6.66</del> <sup>X</sup> OK. Screw eye in cap for grade
			7312	-2.91 *	126.12	118.28	7.84	Temporary rail 6.86
			7382	-2.27	125.58	118.45	7.13	Temporary rail 7.07

\* M.B. Probably wrong. Rod read by S.G. Taylor 2.91  
should probably be 1.91. To be tested with grade lights  
and not used unless it checks with one of these figures - ~~2.56~~ <sup>1.56</sup>  
(1.56 or 2.56)

Grade lights given 7255 = 1.66

7382 1.84

7312 1.56 or 2.56

Breast at 7400

April 12 7269

Advance 131 ft.

Ditch at 7282 - 118 ft from Breast.

Ties at 7255 14.5 ft from Br.

V. pipe at 7225 17.5 ft from Br.

Tunnel wall - corrected Brass plates  $h = 1.03$  ft

pencil mark to Brass plate  $h = 1.00$  ft

Stoner says latter is correct since it is the datum used to  
construct his rating curve. From it  $Q = 9.30$  sec. ft.



April 28, 1914. Elevations						
+S Sta.	+S Rod	H.I.	-S Sta.	-S Rod	-S Elev.	True Tie E.
125.56						
7164	-2.70	122.86	7382	-2.65	125.51	118.45
			7463	-2.60	125.46	118.66
	Turnsheet 20 ft from Breast			+4.15	118.71	118.84
		Breast at 7536			Adv. 267	
		Ditch at 7422			- 114 ft from Br.	

Tunnel Weir  $h = 1.015$   $Q = 9.55$  sec. ft.

Lavigne Creek gage = 0.644 Rocks in weir - has V. of App.

Snake Creek weir full of Rocks.

May 2, 1914.

Breast at 7581 at 9 A.M.

April 2 = 7269  
Advance = 312 ft.

Ditch 108 ft from Breast = 7473

Ties at 7428 = 153 ft from Breast

Sucker pipe at 7335

Tunnel weir 11 A.M.

$h = 1.018$   $Q = 9.58$

Elevations						
125.56						
7164	-1.90	123.66	7382	-1.83	125.49	118.45
			7463 (new plug)	1.79	125.45	118.66
			7563	2.14	125.80	118.91

Elevations Water Snake Lavigne Ditches  
Creek Creek Measurements

Distabire tie

7.06

6.80

At 7280 to 7315 large fissure crosses tunnel strike  $\pm N 25^\circ W$  with variable dip. at 7290 intersects open watercourse on East side.

From 7290 to 7320 timbered.

Small watercourse at 7340 - 2 sets of timber.

Bedding dip variably to  $N 8^\circ E$ . At 7382 dip  $S 12^\circ E$ .

Small vertical watercourse at 7405 Beddings normal at 7415.

At 7450 vertical watercourse crosses tunnel down to 7440.

Beddings flat from 7430 to 7550. 7550 to Br. irregular.

Hard line with bands of chert.

7.04 Tie = 685

6.79 Temp. rail = 6.9

6.89 Temp. rail = 6.8

Grade lights given under 7462 = 1.54  
7563 = 1.64

May 11, 1914  
Elevations

+S Sta	+S Rod	HI	-S Sta	-S Rod	-S Elev	Tract El.	Dist. - Ditch
125.49							
7382	1.71	123.78	7463	1.69	125.47	118.66	6.81
			7562 (new plug)	2.04	125.82	118.91	6.91
			7650	2.80	126.58	119.12	7.46

Breast at 7669.

Tunnel weir at 2.45 PM.  $h = 1.04$

May 13, 1914

Breast at 7702 at 7:30 PM. (Dry)

Sample 5 ft from Breast on Contact Grey & Black Lime.

Black Lime impregnated with pyrite. Ore occurs in

knife blade fissures parallel to the tunnel and in specks in

the grey lime.

Assay - Pb. 9.9%

Cu 0.12%

Ag 3.40%

Au - trace

Zn 3.3%

Fe 3.1%

SiO<sub>2</sub> 65.4%

May 14, 1914 8 AM.

Tunnel weir  $h = 1.06$

May 18, 1914

Tunnel weir  $h = 1.01$  (measured by Friendly.)

Elevations WATER Snake LIVING WATER DITCHES  
Creek Creek MEASUREMENTS



Elevations WATER Snake Laving WATER Ditches  
Creek Creek Measurements

May 22, 1914

Elevations

+S Sta	+S Rod	HI	-S Sta	-S Rod	-S.EI.	Thetic E.I.
El=125.47 7463	-1.06	124.41	7563	-1.42	125.83	118.91
			7650 (hand plug)	-2.24	126.65	119.12
			7680	-2.23	126.64	119.20
			7780	-2.60	127.01	119.45

Brest at 78.09 - Adv 228

Ditch at 7719

Ties & sucker pipe at 7650

Tunnel weir May 21 6 PM, h = 1.03

May 22 11 AM, h = 1.02

Larena weir h=0.909 (uncorrected) M.

May 27, 1914

Tunnel weir h = 1.00 (measured by Friendly)

June 2 1914

Elevations

El=125.83 7563	-1.18	124.65	7780	240	127.05	119.45
			7919	278	127.43	119.80

Bx at 7951 Adv 370

Ditch at 7870

Ties at 7830

V Pipe at 7790

6.92

7.53 Permanent tie = 7.20

7.44 Temporary rail = 7.40

7.56 " " 7.40

Grade lights = 2.56 - 30 = 2.26 (7780)

2.44 - 30 = 2.14 (7680)

2.53 - 30 = 2.23 (7650)

7.60 Perm tie = 7.30

7.63 Temp rail = 7.35

Grade lights 2.60 - 20 = 2.40 (7780)

2.63 - 20 = 2.43 (7919)

Grade tie under 7919 = 7' 5 1/4  
(given to Hancock)

June 10, 1914  
Tunnel weir - 10:30 AM.  $h = 0.99$   $Q = 9.20$

- Elevations -

+S Sta	+S Rod	HT	-S Sta	-S Rod	-S Elev	True Tie El.
El = 125.83						
7563	-1.06	124.77	7780	-2.30	127.07	119.45
			7919 <sup>(new plug)</sup>	-2.83	127.60	119.80
			8037	-2.88	127.65	120.09

Breast at 8052 Advance 101 in 8 days

Ditch at 7960

✓ Pipe & Track 7920

June 20, 1914

- Elevations -

El = 125.83						
7563	-0.99	124.84	7919	-2.75	127.59	119.80
			8040 <sup>(new)</sup>	-2.85	127.69	120.10
			8171	-3.67	128.51	120.43

Breast at 8186 Advance = 235 in 18 days

Ditch at 8085

Ties at 8040

✓ Pipe at 7990

A 2000 ft brass plug cemented into E well

2 ft above ties marked 2000. Plugs 8040 & 8171

measured from 2000 ft plug with 300 ft Luffkin tape.

Tunnel weir  $h = 0.97$  1 P.M.

Elevations Water Snake Landing Water Ditches  
Creek Creek Measurements

Observations

7.62

7.80

7.56

Perm tie 760 ft.

Turn sheet 7.9

Grade lights given 2.80 - 10 = 2.70 (under 7419)  
2.56 - 10 = 2.46 under 8037

7.59

8.08

Perm tie = 750 ft.

Muck on turn sheet

Grade lights under 8171 = 3.08  
under 8040 = 2.59



July 1, 1914.

Elevation

51=127.59

7919

-232

125.37

8040

-242

127.69

120.10

8171

326

128.58

120.43

8292

290

128.17

120.73

7.59

Tie 1.50

8.10

Tie under 8171 = 8.11 OK.

7.44

Mark on transheet.

Estimate for June.

Measured on July 1<sup>st</sup> Estimated for July 2.

Burst at 8307 July 1<sup>st</sup>.

Advance to July 2 -13

Burst at 8320 July 2<sup>nd</sup>.

7951 June 2

Advance

369 ft.

Ditch at 8223

Ties at 8191

V pipe at 8163

1" line at 818 (approx)

} July 2<sup>nd</sup> 1914.

Burst in blacky gray line medium sand.

at 808225 to 808240 - a set of timber.

Formation at this 0 is taken up

July 16<sup>th</sup> 1914  
Elevations

+Sta	+Srod	-Ssla	-Srod	-SElev
8171	3.29	8292	2.92	128.16
		8436	3.72	128.96
Breast at		8453		

July 29, 14

+Sta	+Srod	HI	-Sta	-Srod	-SElev
128.16 8292	174	126.48	8436	-2.53	128.95
			8576	-2.56	128.98
Breast at 8620			Advance 300		

To check movement in concrete.

82996	-1.344	8982	-1.420
		2964	1.432

Three plugs on line at large crack in concrete.

Aug 2 1914.  
Elevations.

128.75 8436	-3.33	125.62	8576	-3.36	128.98
			8658	3.33	128.95

Breast at 8667 Advance 347 ft.  
Ditch at 8565  
Ties at 8506  
V Pipe at 8460.

Elevations Water Snake Laving Creek Measurements Ditches

120.73  
121.09

7.42  
7.87

7.86 Permanent Tie = 7.92 (34" hole)  
7.54 Temp. 12" = 7.94 (8 1/2" hole)

7.54  
7.30 Turn sheet = 7.72

40 ft from Breast small fissure. Dike across the tunnel with 10 feet of tough white sugary material to SE (Sample).  
Breast is in grey lime of good standing and during fracture small amount of water in Breast.  
No timber down 11 month.



Tunnel Wier readings					
Date	hr	h	0	m	sec
July 1	9 Am	101	9.50	1.04	9.95
2	10 "	100	9.30		
3	9 "	102	9.65		
4	10 "	101	9.50		
5	12 "	100	9.30		
6	8 "	101	9.30		
7	9 "	100	9.30		
7			125.85	7	166.30
			9.41		9.47

New measurement gauges are being put in for tunnel and Lake Creek. No readings were taken on Lake Creek or Lavina Creek during the month. Will start taking readings in about 3 days.  
(signed Taylor)

Elevations Aug 14, 14					
128.95					
P436	186	127.09	86.58	-189	128.98
			87.91	-2.13	129.22
					121.65
					121.98

7.33 Permanent tie = 7.30 G.T.

7.24 Temporary rail = 7.35

At 0.8797 (6 ft NW. of P. 4) there are shales across tunnel about due E & W and dips  $\pm 75^\circ$ . This is filling 1 ft thick of blue lime with black specks which make it look like porphyry. It dissolves completely in dilute HCl.

Elevations		Aug 20, 14.			
128.16					
8292	-1.80	126.36	8658	-2.63	128.99
			8791	-2.88	129.24
			8896	-3.25	129.61
Breast at 8920					
Ditch at 8820					
Ditch at 8791					

Sept 2, 1914.

Brass plug marked 9000 placed. 2 1/2 ft above rail in north East wall at a 9000 ft from portal.

Measured from 8000 ft plug with 300 ft Lath in top.

Breast at 9086 11 AM.

Aug 2 8667  
419 ft Advance.

Ditch at 9005 Back 81 ft from Breast  
Ditch at 8961 " 125 " "  
V Pipe at 8911 " 175 " "

Elevations					
128.99					
8658	-1.92	127.07	8791	2.19	129.26
			8894	2.55	129.62
			9051	2.63	129.70

Tunnel wall 6 = 0.48

Elevations WATER SHAKA LAVING WATER Ditches  
Creek Creek Measurements

121.65	7.34	
121.98	7.26	Tie = 7.20
122.24	7.37	Top of Rail = 7.74

Geology - At 8895 beds highly tilted to north and lime is marlized. Limbed from 8915 to 8925 a slight movement to beddings makes ground slough at this point. It is not heavy.

At 8970 there has been considerable movement to beddings which dip 70° N.

From this point to breast ground gradually becomes harder and denser. Breast is highly metamorphosed and extremely hard and dense. In places there are little lenses of igneous intrusions. Contact metamorphic minerals frequent (see samples). Very little distinctly igneous rock as yet.

No water struck this month. Breast dry and dusty.

7.28	
7.38	Perm tie = 7.44
7.07	Rail = 7.7